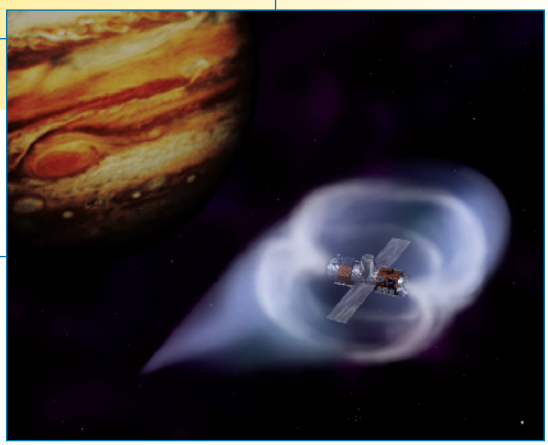
Plasma Sails



NASA researchers and their partners in industry and academia are pursuing plasma sail technologies as a potential future source of in-space propulsion — one that could enable a new era of scientific discovery throughout the solar system.

Plasma sail research is being conducted under the leadership of NASA's In-Space Propulsion Program, managed by the Office of Space Science in Washington, D.C. The program is implemented by NASA's Marshall Space Flight Center in Huntsville, Ala.

The concept of the plasma sail stems from NASA's goal of using natural energy sources found in the environment of space — rather than heavy and costly chemical fuels — to provide alternative means of propulsion for future interplanetary craft. Space-based sail technologies seek to harness the "solar winds," billions of tiny, electrically charged particles constantly jettisoned away from the Sun by the force of its powerful, overlapping magnetic fields. These particles travel through the solar system at top speeds of more than a million miles per hour.

Researchers say an innovative plasma sail craft could be carried on this constant, inexhaustible flow like a hot air balloon in a strong wind stream, reaching flight speeds previously unattainable by chemical propulsion.

Such an idea was first proposed by science fiction writer Carl Wiley in 1951, and advanced as a scientific possibility by physicist Richard Garwin later that decade. But it wasn't until the mid-1990s that practical research into harnessing plasma — or the super-energized gas that would serve as the foundation of such a unique propulsion system — were undertaken.

Now, NASA and its partners are developing an innovative, nearly weightless plasma-drive system that would inflate like a hot-air balloon to surround the entire vehicle, mimicking a natural magnetosphere — the bubble of magnetic power surrounding Earth and other planets — and allowing plasma particles to be converted to a source of propulsion.

Such a craft could, over a period of months, reach maximum flight speeds in excess of 100,000 mph. Compare its speed with that of Voyager 2, the deep space probe launched to the outer planets and beyond in 1977, and powered by a conventional chemical propulsion system. Voyager 2 now travels away from our solar system at roughly 795,000 miles per day. There is enough power in the solar winds to accelerate a 300-pound plasma-drive craft to speeds of up to 180,000 mph — or 4.3 *million* miles a day.

Using this technology, NASA hopes to increase the number and value of future planetary missions. Their ultimate goals: to send routine probes and survey craft to neighboring planets and their satellites in a fraction of the time; to increase payload sizes, duration of research, and communication between craft and researchers on Earth; and to lower overall mission costs.

Early research into innovative plasma-sail concepts was funded by the NASA Institute for Advanced Concepts (NIAC) in Atlanta, Ga.

NASA expects to award computational and experimental research activities for new and existing plasma sail concepts in 2003.

For more information about NASA's In-Space Propulsion Program and plasma sails research, visit:
http://www.spacetransportation.com
http://www.msfc.nasa.gov/news